JOB SHEET

Nutrient Management

Oklahoma Conservation Practice Job Sheet ***590-01***

USDA Natural Resources Conservation Service (NRCS) **February 2003**

Landowner_____

WHAT IS NUTRIENT MANAGEMENT

Nutrient management is managing the source, rate, form, timing, and placement of nutrients.

PURPOSE

Nutrient management utilizes nutrient resources to adequately supply soils and plants to produce food, forage, fiber, and cover while minimizing environmental degradation.

HOW IT HELPS THE LAND

The major role of nutrient management is to minimize nutrient losses from fields, thus helping protect surface and ground water supplies. Nutrient management should be used in conjunction with crop rotation, residue management, pest management, conservation buffers, and/or other practices needed to address natural resource concerns.

WHERE THE PRACTICE APPLIES

Nutrient management is applicable to all lands where plant nutrients and soil amendments are applied.

WHERE TO GET HELP

Nutrient management plans may need to be developed by a certified nutrient management specialist depending on federal, state, and local laws. For assistance in nutrient management planning, contact your local Natural Resources Conservation Service or Conservation District Office.

APPLYING THE PRACTICE

Proper soil sampling is the key for determining fertilizer application rates. Soil samples should be taken at least once every three years for analysis or sooner if the crop rotation changes. Soil samples should be collected at the 0 to 6-inch soil depth. Approximately 20 core samples should be randomly collected from the field or sample area. They should be mixed thoroughly together in a clean plastic container. Place approximately 1 pint of the sample in a bag for testing. The OSU County Extension Service Office is available to assist with the soil testing process. OSU Factsheets are available for more detailed information on soil sampling and soil testing.

The soil laboratory will perform tests for nitrogen, phosphorus, potassium, and pH as well as other requested tests. A fertilizer recommendation will be made based on the crop and yield goal.

INORGANIC FERTILIZER

When applying inorganic sources of fertilizer, actual application rates should be as close as possible to recommended rates. Timing of application should correspond with the plants nutrient uptake characteristics.

ORGANIC FERTILIZER

Nutrient values of organic fertilizers (manure or organic by-products) need to be determined by laboratory analysis prior to application. The analysis should include a minimum test of moisture content, nitrogen, phosphorus, and potassium. Historic laboratory manure analysis values may be used in lieu of annual testing provided at least 2 years of testing history are available prior to application. The historic values must provide an accurate analysis of the material being applied. Manure analysis must be performed once every three years or sooner depending on federal, state, or local laws. This could correspond with soil sampling procedures.

COMMERICAL STARTER FERTILIZERS

Starter fertilizers containing N, P, and K may be needed for row crops to help overcome early stress of the root environment such as cool, wet soil. Starter fertilizers are applied in the row with seed or banded along side the seed. Banded rates may vary depending on crop and climate. The amount of starter fertilizer applied will be included in the nutrient budget. The OSU Extension Service is available for detailed assistance.

NUTRIENT BUDGETS

A nutrient budget for N, P, K, and pH needs to be developed to account for all sources of nutrients available for plant growth. Nutrient budgets need to be developed when manure is applied, or when the soil test for P or N exceeds crop needs based on OSU recommendations, or when the field is in a watershed identified as Nutrient Limited Waters (NLW) by the Oklahoma Water Resources Board.

FIELD RISK ASSESSMENT

When manure or other organic by-products are planned for use, a field assessment to determine the potential transport of phosphorus from the site will need to be completed. The assessment will be made using the Oklahoma Phosphorus Assessment.

USING MANURE OR ORGANIC BY-PRODUCTS TO IMPROVE SOIL CONDITION

Organic material used for building soil condition should be incorporated into the soil within 72 hours of application to the field.

When non-legume crop yields exceed goals by more than 10%, or when a non-legume crop is terminated and returned to the soil (as a green manure crop), additional nitrogen may be needed to supplement the nitrogen used by the soil microbes. Estimated nitrogen amounts needed per ton of crop residue are:

- Add 10 lbs. of N per ton of dry crop residues
- Add 5 lbs. of N per ton of green manure crop produced

CONSIDERATIONS

Consider application methods and timing that reduce the risk of nutrients being lost. These include:

- Split applications of N to provide nutrients at times of maximum crop utilization
- Avoid winter nitrogen application for spring crop utilization
- Band applications of phosphorus near the seed row
- Apply nutrient material as uniformly as possible.
- Calibrate spreading machinery periodically to insure proper application rate

Consider cutting forage for hay whenever possible. Nutrients that are removed from the site in the hay can be feed in other locations. When using the field under a continuous grazing system, approximately 80% of the nutrients are recycled in the field causing nutrient levels to elevate much quicker.

Consider potential problems from odors associated with manure applications.

Consider cover crops to recycle residual nitrogen.

Consider protecting nutrient storage areas from weather to minimize runoff and leakage.

Consider avoiding unnecessary exposure to fertilizer and organic waste, and wear protective clothing when necessary.

NUTRIENT MANAGEMENT PLANS

Nutrient management plans may need to be developed and approved by a certified nutrient management specialist depending on federal, state, or local laws.

Nutrient management plans need to include the following information:

- field map and soil map
- crop rotation or sequence
- results of soil, water, plant, and organic material samples analyses
- expected crop yield
- sources of nutrients to be applied
- nutrient budget, including credits of nutrients available
- recommended nutrient rates, form, timing, and method of application
- location of designated sensitive areas
- guidelines for operation and maintenance

OWNER/CLIENT RESPONSIBILITY

The owner/client is responsible for the safe use of this practice. The owner/client should consider addressing the following:

- Review nutrient management plans at least every 3 years or more often if needed.

- Revisions or modifications to the plan may be needed when changes in animal numbers occur, feed rations change, crop rotations change, storage facilities change, application methods change, or laws and regulations change.
- Maintain records of nutrient application as required by state and local regulations. When actual rates used differ from planned rates, record the reasons for the difference.
- Protection of fertilizer and/or organic by-products storage facilities from weather and accidental leakage.
- Records to document plan implementation should include:
  - Soil test results and recommendations
  - Quantities and analyses of nutrients applied
  - Dates and methods of applications
  - Crops planted, harvest and planting dates, yields, and residues removed
  - Results of water, manure, and organic by-product analyses
  - Dates of plan review, person making review and results of review

Records should be maintained for at least 5 years or for the period required by any federal, state, or local laws, or for the duration of program or contract period.

NUTRIENT MECHANICS

Phosphorus

Phosphorus (P) is an essential element in plant growth and is necessary to maintain profitable crop production. However, P enrichment of waterbodies can increase the biological productivity of surface waters by accelerating eutrophication. Eutrophication is the natural aging of lakes or streams brought on by nutrient enrichment. Eutrophication can cause use restrictions of water due to increased growth of undesirable algae and aquatic weeds. Excessive plant growth can lead to reduced dissolved oxygen levels in the water as plants die and use oxygen in the decomposition process. Low oxygen levels are detrimental to fish and other aquatic life. Associated surface blooms of algae brought on by P nutrient enrichment may cause problems such as foul smelling water and water that is highly toxic to humans and animals. This can led to increased costs for water suppliers to treat the water.

Although P is an essential nutrient, most plants require relatively small amounts for proper growth. Many grasses and legumes only contain about 0.2% to 0.3% P per pound of dry matter. For example, three tons of bermudagrass would use about 12 lbs. of P (6000 x 0.002 = 12 lbs. of P). Some annually planted crops can use almost as much P as grasses depending on the yield achieved. OSU estimates that for each 15 lbs. of P_2O_5 (6.6 lbs. P) applied but not used by the plant, the soil test P Index will increase approximately 1 lb. per acre. Therefore applying P at levels well above crop requirements will rapidly cause a buildup of P in the soil.

The loss of P in runoff occurs in sediment bound and dissolved forms. Sediment bound P includes P attached to soil particles and organic matter leaving the field during flow events and transported in surface runoff. This occurs primarily on cropland. Surface runoff from grass or forests carries very little sediment and therefore is dominated by dissolved P in the runoff. This dissolved P comes from the release of P as runoff water flows across the soil surface. Evidence suggests that as soil test P increases, so does the potential for dissolved P to increase in runoff. Research is also showing that characteristics such as, slope, application timing, method, rate, and distance to waterbodies also play a part of P leaving the site. The Oklahoma Phosphorus Assessment tool was developed to assess the transport of P from fields where manure applications are made.

The overall goal to reduce P losses from the field to surface water should include balancing P inputs in feed and fertilizer with P outputs from crops and animals. However, this may not always be possible and other treatments will be needed. Conservation practices that reduce soil erosion, slow or eliminate runoff, trap sediment and increase water infiltration in the field will help reduce P loss from fields.

Nitrogen

Nitrogen (N) in the soil reacts much differently that P. It is much more water soluble than P and therefore, can dissolve in runoff or leach through the soil profile before being used by the plant. It is also more volatile and can be lost as a gas to the atmosphere.

Movement of nitrogen into surface waters occurs through runoff or leaching into groundwater. As N levels increase in surface waters, aquatic weed and algae populations increase accordingly. This can reduce the oxygen supply in water and cause the same problems for fish and aquatic organisms as described for high levels of P. High nitrate nitrogen in drinking water is also detrimental to other animals and humans. Nitrogen should always be applied at recommended rates and balanced with the crop capacity to utilize nutrients.

Nutrient Management - Specification Sheet

Landowner:	Field No.:	Acres

Purpose (Check all that apply)

☐ Budget and supply nutrients for plant production	☐ Utilize organic material as nutrient source
☐ Minimize agricultural nonpoint source pollution	☐ Maintain or improve soil condition

Crop Sequence/Rotation	Expected Yield

Nutrient Content of Manure per ton

N Test	N Remaining	P_2O_5	K_2O

Current Soil Test Levels

N	P	K	pH	SOM%	EC

Recommended Nutrients to Meet Expected Yield and Grass Establishment (See Tables in 590 Standard)

N	N for Grass Est.	P_2O_5	K2O	Lime	Other

Nutrient Sources

Credits	N	P_2O_5	K_2O
1. Nitrogen credits from previous legume crop			
2. Residual from long-term manure application			
3. Irrigation water			
4. Other (Atmosphere, etc.)			
5. Total Credits			

Applied Nutrients		N		P_2O_5		K_2O	
		Alt. 1	Alt. 2	Alt. 1	Alt. 2	Alt. 1	Alt. 2
6. Fertilizer	Starter						
	Other						
7. Manure or Organic by-products							
8. Total Applied Nutrients							
9. Total Nutrients (add lines 5 and 8 plus N from Soil Test)							
10. Recommended Nutrients							
11. Nutrient Status (subtract line 10 from 9)							

If line 11 is a negative number, this is the amount of additional nutrients needed to meet the crop recommendation.
If line 11 is a positive number, this is the amount by which the applied nutrients exceed the crop requirements.

Nutrient Management Decision - Including method, rate, form and timing of application.	Producer Selected Alternative:	

Nutrient Management – Job Sketch

Draw or sketch the field, showing any sensitive areas and required setback zones. Inside each sketched field, enter total field acres and net application acres. Other relevant information, such as complementary practices or adjacent field or tract conditions may be included.

Scale 1"= _____ ft. (NA indicates sketch not to scale: grid size=1/2" by 1/2")

Perform the following operations and maintenance:

Review this nutrient management plan every ____ years
Maintain field records for at least 5 years.
Calibrate application equipment to apply at recommended rates.
Handle all nutrient material with caution. Wears appropriate protective clothing.
Clean up residual material from equipment and dispose of properly.

Additional specifications and notes: